



CROP DIVERSIFICATION REGIONS IN SINA RIVER BASIN: MAHARASHTRA

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Abstract

Agriculture is a prime economic activity of people in Sina river basin. The concept of region is significant in study of agricultural geography. Agricultural regionalization provides a sound footing and explanation of agricultural practices in an area. Crop diversification is an important method of agricultural regionalization and it is useful for analysis of agricultural practices and planning at micro level such as in Sina river basin. In the present research paper an attempt has made to delineate crop diversification regions in Sina river basin of Maharashtra by applying Gibbs and Martin's index of crop diversification. Different crop diversification regions are the results of difference in soil properties, availability of irrigation facilities and farmer's changing trend towards taking different crops in a season from same piece of field.

Keywords: Region, Agricultural Regionalization, Crop Diversification.

Introduction:

The concept of region developed in the 18th century is still a basic notion in geography. Classically, 'region is a differential segment of the earth surface' (Whittlesy, 1929) or an area having homogeneity in physical and cultural characteristics. As this phrasing suggest, the study of regions was for long time closely identified with a definition of geography as the study of areal differentiation. The delineation of crop diversification regions help in understanding the attributes of agriculture of the given region and explains the decision making process of the farmers. An in-depth understanding of such regions also helps in generalization and the formulation of sound strategies for agricultural planning and development. Diversification in cropping pattern means a variety of crops cultivation on the arable land. The study of crop diversification is of vital important in judging the competition amongst crops for area, scope for rotation in order to maintenance of fertility of soil which ultimately affects agricultural productivity. Crop diversification implies obtaining of the maximum number of crops from the soil. The risk due to natural hazards could be reduced by adopting crops diversification. Crop diversification may refer to the competition that exists among crops in a region. (K. Neerja and B. Krishna Reddy and Y.V. Ramaniah, 2004).

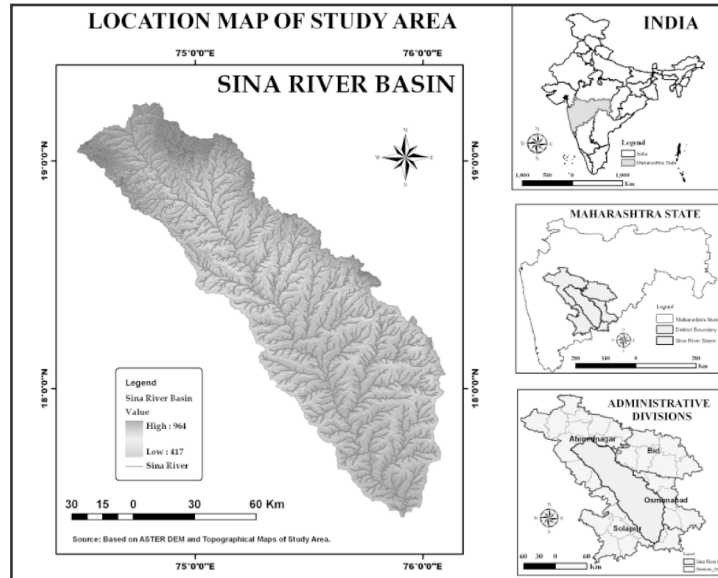
Crop diversification is a concept which is opposite to crop specialization. The farmers all over the world, especially in the developing countries, try to grow several crops in their holding in an agricultural year. In general, higher the level of agricultural technology; lesser will be the degree of diversification. In fact, "it is obvious that greater the number of crops in a combination, greater the degree of diversification" (Ayyar, 1969). Crop diversification leads the competition among the different crops and adoption of judicious crop in order to maintain fertility of soil with mixed farming.

Study Area:

Sina river basin lies in drought-prone area of Maharashtra and is a sub-basin of Bhima river. The study region extended from 17° 22'43" North Latitude to 19°09'09" North Latitude and 74°43'11" East Longitude to 75°53'48" East Longitude. The total geographical area of the river basin is about 12051.446 sq. kms. It accounts 4.73 per cent to the total of Krishna Basin (254743.31sq.k.ms). The study area is bounded by Rahuri tehsil of Ahmednagar district to the north, Beed and Osmanabad districts to the east, Karnataka state to the south and Malshiras and Pandharpur tehsils of Solapur district to the west. Study area comprises a) the parts of Ahmednagar, Pathardi, Parner, Shrigonda, Karjat and Jamkhed tehsils of Ahmednagar district, b) whole Ashti tehsil of Beed district, c) whole

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Paranda tehsil and parts of Bhum, Osmanabad and Tuljapur tehsils of Osmanabad district and d) Whole Barshi and North Solapur tehsils and parts of Karmala, Madha, Mohol and South Solapur tehsils of Solapur district. (Fig. 1)



The present work is based on secondary data. The data related to cropping pattern is collected from District Socio-Economic Abstracts of Ahmednagar, Beed, Osmanabad and Solapur district. ASTER data downloaded from USGS website and the same used for extracting and Mapping the study area by applying ArcGIS ver.9.3.

Agricultural statistics used in the present study relate to the tehsil level and are decadal (i.e. 1990-91 and 2010-11). In order to delineate crop diversification regions in study area Gibbs J. and W. Martin's (1962) index of crop diversification has applied as below:

$$\text{Index of crop Diversification} = 1 - \frac{\sum x^2}{(\sum x)^2}$$

Where, x= the percentage of total cropped area occupied by each crop in areal unit Tehsil has been taken as an areal unit for the study. In order to determine index value of crop diversification the area covered by various crops in each tehsil has been converted into percentages, then area covered by all crops in a tehsil has been summed up and the same values applied in the formula. As per this method, if the index value will be zero then there will be lack of crop diversification. By using the above formula, crop diversification index values calculated and shown in table 1.1 and Figure No 1.1 and also figure 1.2 for the year 1990-91 and 2010-11 respectively. Finally Crop diversification regions in Sina river basin has been delineated and interpreted as below:

- 1 Areas of High Diversification (Index Value > 0. 80)
- 2 Areas of Moderate Diversification (Index Value > 0. 60 to 0.79)
- 3 Areas of Low Diversification (Index Value > 0. 59)

Crop Diversification Analysis

The study of crop diversification is an important aspect in agricultural geography. Crop diversification index is useful for measuring the degree of crop diversification in an area. This method has an advantage over the other methods in the sense that the hectare area of crops need not to be

reduced to percentages and the magnitude of diversification is in direct proportion; hence for the present study of crop diversification analysis Gibbs and Martin's index has been applied.

Table 1.1
Crop Diversification Regions in Sina River Basin (1990-91 and 2010-11)

Types of Diversification	Index Value	No. of Tehsil		Area in Hectares		Area in %	
		1990 - 91	2010 - 11	1990 -91	2010 -11	1990 - 91	2010- 11
High	>0. 80	0	4	0	432171	0.00	19.42
Moderate	0.60 to 0.79	4	8	655515	1022194	33.84	45.93
Low	< 0.59	13	5	1281606	771053	66.16	34.65
	Total	17	17	1937121	2225418	100	100

Source: Based on Socio-Economic Abstracts 1990-91 and 2010-11

1. Areas of High Diversification (Index Value > 0.80)

Crop diversification of crops implies multiple cropping in such a way that growing more than two crops from the same farm. In Sina river basin diversified nature of crops was prevalent. In 1990-91, it is observed that none of the tehsil has noticed high diversification of crops. However, in 2010-11, four tehsils formed a continuous zone having high diversification index values viz. Osmanabad (0.80), Paranda (0.83) Tuljapur (0.84) and Bhum (0.86). The important crops cultivated in these tehsils were jowar, bajra, wheat, maize, tur, mung, gram, udid, sugarcane, cotton, onion, sunflower, fruits and vegetables.

Table 1.2
Crop Diversification Index in Sina River Basin(1990-91 and 2010-11)

Sr. No.	Tehsil	Crop Diversification Index	
		1990-91	2010-11
1	Ahmednagar	0.37	0.51
2	Pathardi	0.30	0.75
3	Parner	0.42	0.49
4	Shrigonda	0.33	0.64
5	Karjat	0.28	0.52
6	Jamkhed	0.38	0.44
7	Ashti	0.47	0.65
8	Paranda	0.46	0.83
9	Bhum	0.67	0.86
10	Osmanabad	0.63	0.80
11	Tuljapur	0.77	0.84
12	Karmala	0.42	0.7
13	Madha	0.50	0.71
14	Barshi	0.60	0.7
15	Mohol	0.39	0.66
16	N. Solapur	0.34	0.58
17	S. Solapur	0.56	0.72

Source: Based on Socio-Economic Abstracts 1990-91 and 2010-11

All crops were cultivated under rain fed conditions except sugarcane. Out of total gross cropped area (2225418 hectares), 19.42 per cent (432171 hectares) area was under high diversification. It is observed that these tehsils have a high degree of diversification due to the extreme moisture conditions retained in the soil and also farmers grown several crops to meet their family demands. It is interesting to note here that tehsils having high diversification of crops in Sina river basin were only from Osmanabad district which formed central-eastern part of Sina river basin. This part of basin benefited from both the south-west and north-east monsoon. Due to the high diversification of crops in these tehsils a number of farmers and agricultural labor remain busy in various agricultural practices such as farm ploughing, sowing, inter-tillage of crops, weeding, harvesting, marketing etc. of various crops throughout the year.

2. Areas of Moderate Diversification (Index Value > 0.60 to 0.79)

While studying crop diversification in Sina river basin it is found that, in 1990-91 four tehsils viz. Barshi (0.60), Osmanabad (0.63), Bhum (0.67) and Tuljapur (0.77) formed a continuous zone having moderate level of diversification with occupying 655515 hectares (33.84 per cent) area. It is also observed that, all these tehsils of moderate diversification in eastern part of Sina river basin with maximum numbers i.e. 3 in Osmanabad district. Along with cereals the area under pulses and oilseeds was also significant in this agricultural region. The amount of rainfall in these tehsils is evenly distributed in monsoon period.

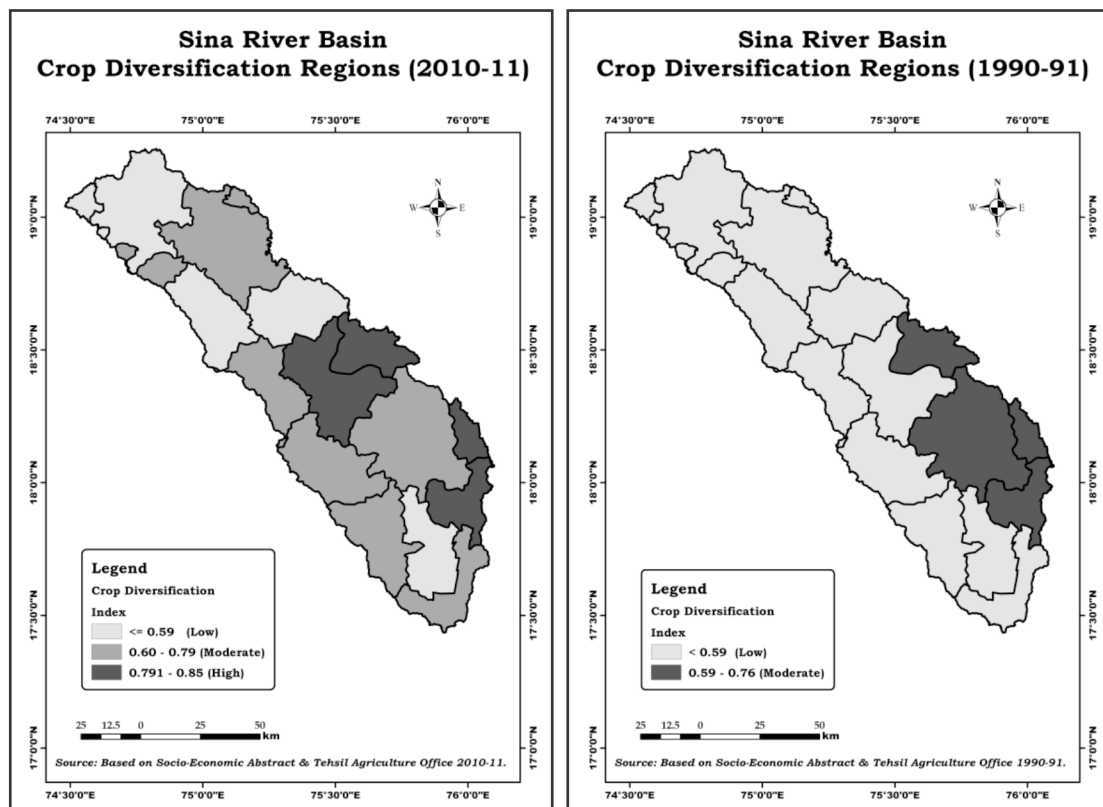


Fig. 2 Crop Diversification in Sina River Basin

However in 2010-11, eight tehsils viz. Mohol (0.60), Shrigonda (0.64), Ashti (0.65), Karmala (0.70), Barshi (0.70), Madha (0.71), South Solapur (0.72) and Pathardi (0.75) with 1022194 hectares (45.93 per cent) area have noticed moderate diversification of crops. It is significant to note here that high proportion of area noticed under moderate diversification in the study area. It is found that most of tehsils occurred in moderate diversification region are on the western side of the Sina river course where rainfall variability was always high. This level of diversification doesn't see in the tehsils of Osmanabad district which are on eastern side of Sina River. Important crops cultivated in this level of diversification were jowar, bajra, wheat, maize, gram, sugarcane, cotton, fruits and vegetables.

3. Areas of Low Diversification (Index Value > 0.59)

Thirteen tehsils having 1281606 hectares (66.16 per cent) area to the GCA has low diversification of crops in 1990-91. It includes Karjat (0.28), Pathardi (0.30), Shrigonda (0.33), North Solapur (0.34), Ahmednagar (0.37), Jamkhed (0.38), Mohol (0.39), Parner (0.42), Karmala (0.42), Paranda (0.47), Madha (0.50) and South Solapur (0.56). It is clear that the highest proportion of area was under low diversification of crops. It is observed that majority area in these tehsils were under jowar crop in 1990-91; where monoculture has been practiced and hence 76.47 per cent tehsils in Sina river basin experienced low level of diversification on the one hand and crop specialization on the other.

Only five tehsils namely Jamkhed (0.44), Parner (0.49), Ahmednagar (0.51) and Karjat (0.52) tehsils of Ahmednagar district and North Solapur (0.58) tehsil of Solapur district noticed low level of crop diversification in 2010-11 with 34.65 per cent area to the GCA. Generally northern portion of Sina river basin has gone through low diversification of crops.

Conclusion

Delineation of agricultural region on the basis of certain peculiarities in agricultural practices is an important task in the field of agricultural geography. Though the Sina river basin is an agrarian region, there are variations in agricultural systems. Some crops are grown in isolation but a number of crops grown in combination with other in the study area. It is found that jowar crop dominated the agricultural sector in the study area. More than fifty percent tehsils in river basin occurred in monoculture and jowar was the main crop of this region in 1990-91. Thirty five percent tehsils experienced two crop combination with jowar was leading crop. Other crops in two crop combinations were safflower, tur, bajra and wheat. Only two tehsils noticed three crop combination and they also have jowar was main crop. Other crops in these combinations were wheat, tur and gram in 1990-91. The scenario of crop combination in the study area has been totally changed in 2010-11, only five tehsils noticed monoculture whereas nine tehsils occurred in two crop combinations. As far as three crop combinations are concerned, three tehsils noticed this region. By comparing crop combination regions during the period of investigation, it is clear that the basin has gone through remarkable changes with the importance of jowar crop is decreasing in terms of area it covered and at the same time crop diversification is increasing. It is found that the crop diversification is a distinctive feature in Sina river basin and also a part of agricultural management. The data obtained and analyzed so far clearly indicates that all tehsils in Sina river basin are experiencing crop diversification. Highest diversification is found in Tuljapur and Bhum tehsils in Osmanabad district in 1990-91 and 2010-11 respectively whereas lowest diversification observed in Karjat and Jamkhed tehsils in Ahmednagar district in 1990-91 and 2010-11 respectively.

Due to the erratic nature of monsoon farmers were taken a number of crops on their operational holdings in order to get some return under adverse climatic conditions. Traditional agricultural practice also forces the inhabitants of basin to have most of their domestic needs from the same farm land in a crop season. Apart from these, in order to maintain soil fertility and employment

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throughout the year crop diversification is being emphasized by agricultural experts.

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